

# Serial Bluetooth Converter for V.24 (RS-232), RS-422, and RS-485 2-Wire Bus Systems

## PSI-WL-RS232-RS485/BT

### 1. Description

The Bluetooth converter provides a quick and easy wireless connection between serial interfaces of the V.24 (RS-232), RS-422, and RS-485 2-wire standard.

The wireless connection can extend up to 150 m and is based on the international license-free Bluetooth standard.

This wireless standard meets high requirements for interference-free data transmission, in particular through the use of the FHSS method (Frequency Hopping Spread Spectrum) with the 2.4 GHz ISM band.

The Bluetooth converter can be used for a wide range of different applications, for example:

- Replacement of simple, serial point-to-point cabling for V.24 (RS-232), RS-422, and RS-485 2-wire interfaces.
- Creation of master/slave multi-drop connections.
- Wireless operation and monitoring for processes.
- Wireless parameterization, and diagnostic and programming connections.
- Replacement of slip ring joints or drag chains.
- Implementation of high-quality electrical isolation between the stations.

The **PSI-WL-RS232-RS485/BT** serial Bluetooth converter is designed for industrial use and features the following performance characteristics:

- Mounting by snapping on to an EN DIN rail
- Supply of 24 V DC or AC
- Transmission speed of up to 187.5 kbps
- Can be set to V.24 (RS-232), RS-422 or RS-485
- Supports all popular 10/11-bit UART data formats
- 3964R-compatible
- External antenna connection for optimum antenna positioning
- Bluetooth access protected by password, fixed device pairing or device access list
- Scalable transmission power (-28 to 20 dBm) for specific localization of the radio cell
- Integrated Bluetooth path diagnostics indicate the signal quality of the radio connection.



Should you have any technical questions, please contact us:

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The **PSI-WL-RS232-RS485/BT** Bluetooth converter is accessed via a second, identical device or via the **PSI-WL-PLUG-RS232/BT** V.24 (RS-232) adapter, which is in the form of a connector. Wireless access via third-party devices, which already have an integrated Bluetooth interface, e.g., PDA, notebook or cell phone, is also supported (see page 2).

## 2. Application

### 2.1 Point-to-Point Connections

#### Point-to-Point

##### Without Termination Device Addressing (V.24 (RS-232), RS-422, etc.)

- Direct programming connection between a laptop and a programmable logic controller (Figure 02).

Programming device and PLC



Figure 02

- Data connection between a third-party device with integrated Bluetooth interface (PDA, cell phone, etc.) and an industrial controller (Figure 03).

PDA and PLC

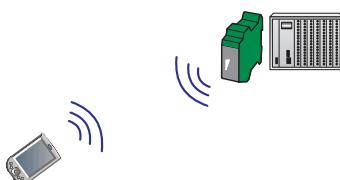


Figure 03

- Connection between a mobile operator interface and an industrial controller (Figure 04).

PLC and operating panel

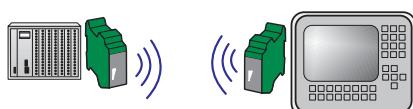


Figure 04

#### Point-to-Point

##### With Termination Device Addressing (RS-485 2-Wire)

- Integration of a device into an existing bus system, e.g., Modbus, PROFIBUS, etc. (Figure 05).

RS-485 2-wire bus system

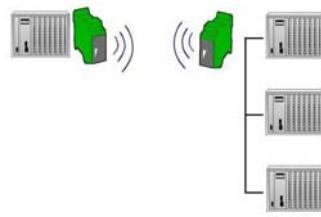


Figure 05

### 2.2 Multi-Drop Connections

Networking for automation components.  
Up to seven Bluetooth slaves can be connected to a Bluetooth master (Figure 06).

1x master and up to 7x slaves

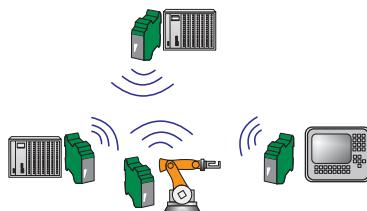
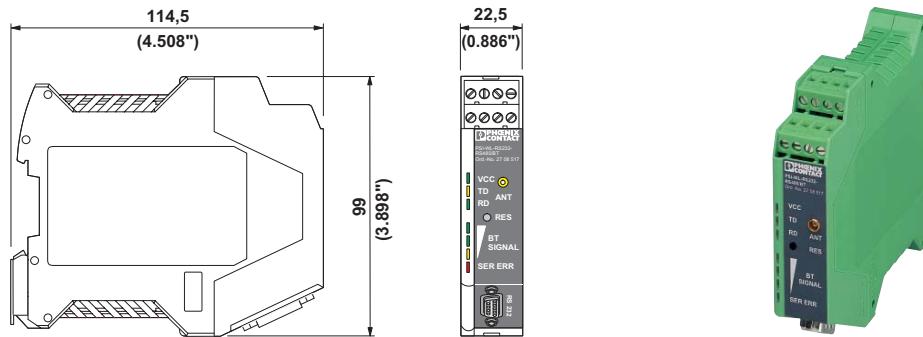


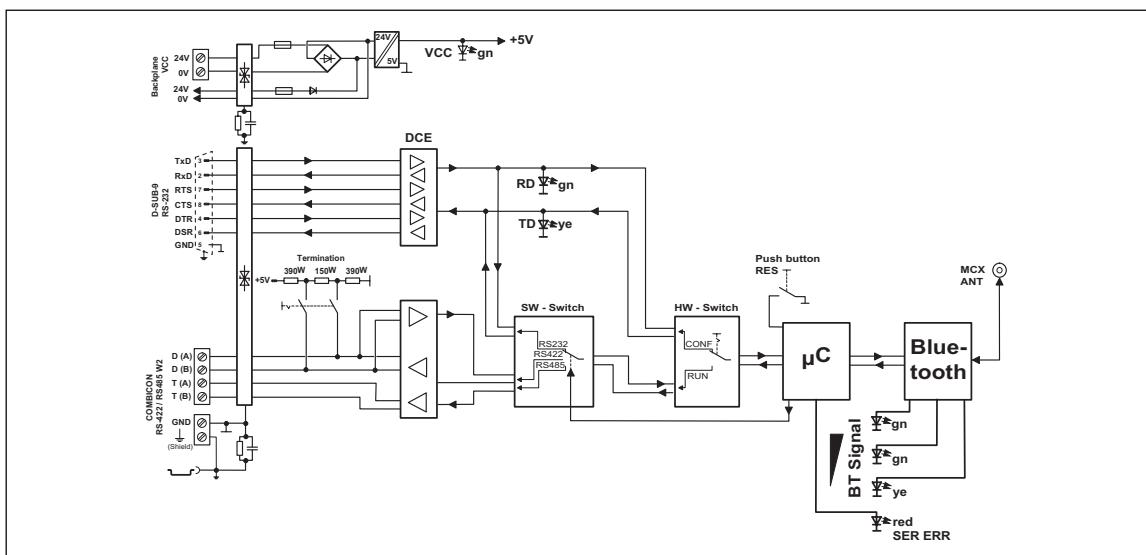
Figure 06

### 3. Technical Data



PSI-WL-RS232-RS485/BT

UL (in preparation)



| Description                                                                                                                                                                                                                                              | Type                      | Order No.  | Pcs./Pkt. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------|-----------|
| <b>Bluetooth converter for converting V.24 (RS-232)/RS-422/RS-485 2-wire to Bluetooth, range up to 150 m, DIN rail mounting, 24 V supply.</b><br>Scope of supply:<br>DIN-rail mountable Bluetooth device, CD with configuration software and user manual | PSI-WL-RS232-RS485/BT     | 27 08 51 7 | 1         |
| <b>Accessories</b>                                                                                                                                                                                                                                       |                           |            |           |
| <b>Lambda/4 antenna with omni-directional characteristics,</b><br>mounting bracket, antenna cable with angled antenna connector.<br>Gain<br>Polarization<br>Impedance<br>Degree of protection<br>Dimensions                                              | RAD-ISM-2400-ANT-OMNI-2-1 | 28 67 46 1 | 1         |
| <b>Panel antenna with directional characteristics,</b><br>mounting clamp and antenna connection.<br>Gain<br>Polarization<br>Impedance<br>Degree of protection<br>Dimensions (H x W x D)                                                                  | RAD-ISM-2400-ANT-PAN-8-0  | 28 67 61 0 | 1         |
| <b>Coaxial antenna cable for panel antenna.</b><br>Connections<br>Attenuation<br>Impedance                                                                                                                                                               | RAD-PIG-EF316-MCX-SMA     | 28 67 67 8 | 1         |

| Additional Accessories                                                                                                  | Type                                                  | Order No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Pcs./Pkt.   |
|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>System power supply primary switched.</b><br>Input voltage range<br>Nominal output voltage<br>Nominal output current | 45 to 65 Hz<br>85 to 264 V AC<br>24 V DC ±1%<br>1.5 A | MINI-SYSPS-100-240AC/24DC/1.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 28 66 983 1 |
| <b>DIN rail bus connector</b>                                                                                           |                                                       | ME 22,5 TBUS 1,5/ 5-ST-3,81 GN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 27 07 437 1 |
| <b>Technical Data</b>                                                                                                   |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |
| <b>Supply</b><br>Supply voltage 1                                                                                       | (function elements 12 - 13)                           | 10 to 30 V DC,<br>24 V AC ±20%<br>Via plug-in COMBICON screw terminal block<br>Protection against polarity reversal via bridge rectifier                                                                                                                                                                                                                                                                                                                                                                                                           |             |
| Supply voltage 2<br>(alternative or redundant)                                                                          |                                                       | 24 V DC ±20%<br>Via backplane bus contact and appropriate system power supply,<br>protection against polarity reversal via series diode.                                                                                                                                                                                                                                                                                                                                                                                                           |             |
| Frequency                                                                                                               | DC or 50 to 60 Hz                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |
| Nominal current consumption                                                                                             | 40 mA at 24 V DC<br>70 mA RMS at 24 V AC              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |
| LED indicator                                                                                                           | (function element 9)                                  | VCC (green LED):<br>- Steady light during operation in RUN mode<br>- Flashing during operation in CONF mode                                                                                                                                                                                                                                                                                                                                                                                                                                        |             |
| <b>Configuration</b>                                                                                                    |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |
| System requirements                                                                                                     |                                                       | Windows 98 SE, 2000, NT4, XP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |
| Configuration interface                                                                                                 |                                                       | V.24 (RS-232), Bluetooth,<br>The system is configured in CONF mode via the V.24 (RS-232)<br>interface and the configuration software provided.<br>Either the local device is configured or a remote device is configured<br>via Bluetooth.                                                                                                                                                                                                                                                                                                         |             |
| <b>V.24 (RS-232) Interface</b>                                                                                          |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |
| Physics                                                                                                                 | EIA/TIA RS-232                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |
| Connection                                                                                                              | (function element 1)                                  | 9-pos. D-SUB pin strip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |
| Device type                                                                                                             |                                                       | DCE (Data Communication Equipment) with 1:1 cable<br>to DTE (Data Terminal Equipment).                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |
| Signal assignment                                                                                                       |                                                       | TxD = 3, RxD = 2, RTS = 7, CTS = 8, DTR = 4, DSR = 6, GND = 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |             |
| Data format                                                                                                             |                                                       | Serial asynchronous UART/NRZ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |
| Encoding                                                                                                                |                                                       | 7/8 data, 1/2 stop, 1 parity, 10/11-bit character length<br>can be adjusted via software.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |
| Protocols                                                                                                               |                                                       | Transparent protocol, including 3964R protocol                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |
| Serial transmission speed                                                                                               |                                                       | 0.3, 1.2, 2.4, 4.8, 7.2, 9.6, 19.2, 31.25, 38.4, 57.6, 75, 93.75, 115.2,<br>136, 187.5 kbps can be adjusted via software.                                                                                                                                                                                                                                                                                                                                                                                                                          |             |
| Data flow control                                                                                                       |                                                       | <b>Hardware handshake:</b><br>- Termination device directly with the Bluetooth converter via<br>RTS/CTS<br>- Data transmission speed of up to 187.5 kbps<br><b>Software handshake (Xon/Xoff):</b><br>- Software handshake is negotiated directly between the termination<br>devices<br>- Setting on Bluetooth converter = "none"<br>- Data transmission speed of up to 38.4 kbps<br><b>Message-oriented protocols, e.g., Modbus, PROFIBUS, etc.:</b><br>- Setting on Bluetooth converter = "none"<br>- Data transmission speed of up to 93.75 kbps |             |
| Default upon delivery                                                                                                   |                                                       | 9.6 kbps, 8 data, no parity,<br>1 stop bit, hardware handshake                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |
| LED indicator/serial data indicator                                                                                     | (function elements 7 - 8)                             | TD (yellow LED), dynamic, serial port is transmitting data,<br>RD (green LED), dynamic, serial port is receiving data                                                                                                                                                                                                                                                                                                                                                                                                                              |             |
| LED indicator/serial system diagnostics                                                                                 | (function element 2)                                  | SER ERR (red LED),<br>parity error, handshake error, buffer data overrun                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |

|                                                                        |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RS-422/RS-485 2-Wire</b>                                            |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Physics                                                                |                                                                                     | EIA/TIA RS-422 and RS-485 2-wire,<br>can be switched via configuration software,<br>default upon delivery is V.24 (RS-232)                                                                                                                                                                                                                                                                                                                                         |
| Connection                                                             | (function elements 10 - 11, 14 - 17)                                                | Plug-in COMBICON screw terminal block                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Termination resistor/termination                                       | (function element 19)                                                               | 390 - 150 - 390 Ω can be enabled in the device, default upon delivery is OFF                                                                                                                                                                                                                                                                                                                                                                                       |
| Signal assignment for RS-422                                           |                                                                                     | Transmit pos. = TB, Transmit neg. = TA,<br>Receive pos. = DB, Receive neg. = DA<br>Signal ground = GND, Shield connection = FE                                                                                                                                                                                                                                                                                                                                     |
| Signal assignment for RS-485 2-wire                                    |                                                                                     | Transmit/Receive pos. = DB, Transmit/Receive neg. = DA                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Bluetooth Interface</b>                                             |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Physics                                                                |                                                                                     | Bluetooth 1.1 Specification                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Frequency                                                              |                                                                                     | 2.402 GHz to 2.480 GHz (ISM band 2.4 GHz)                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Channel distance                                                       |                                                                                     | 1 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Bandwidth                                                              |                                                                                     | 79 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Channels                                                               |                                                                                     | 79                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Transmission method                                                    |                                                                                     | Frequency hopping 1.6 kHz (FHSS)                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Radio approvals                                                        | USA (in preparation):<br>Canada (in preparation):<br>Europe:<br>Approved countries: | FCC/CFR 47, Part 15<br>RSS-210<br>ETSI EN 300 328, 300 826<br><b>EU countries:</b><br>Belgium, Denmark, Germany, Estonia, Finland, France, Greece, Great Britain, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Austria, Poland, Portugal, Sweden, Slovakia, Slovenia, Spain, Czech Republic, Hungary, Cyprus<br><b>Non-EU countries:</b><br>Iceland, Norway, Switzerland, USA, Canada<br>Other countries on request                          |
| Notification                                                           |                                                                                     | EU countries, Iceland, Switzerland, Norway                                                                                                                                                                                                                                                                                                                                                                                                                         |
| R&TTE device class                                                     |                                                                                     | Class 2                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Usage restrictions according to<br>ERC Recommendation 70-03/April 2004 |                                                                                     | <b>France:</b> Outside buildings the maximum transmission power is 10 mW (10 dBm), (note antenna data and software settings)<br><b>Italy:</b> Outside buildings a license is required for operation and the maximum transmission power is 10 mW (10 dBm), (note antenna data and software settings)                                                                                                                                                                |
| Bluetooth device class                                                 |                                                                                     | Class 1 = 100 mW (20 dBm), maximum                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Transmission power                                                     |                                                                                     | 20 dBm = default upon delivery,<br>can be set via software from -28 dBm to +20 dBm                                                                                                                                                                                                                                                                                                                                                                                 |
| Range guide values<br>(depending on the application environment)       |                                                                                     | 20 dBm = 80 m to 150 m<br>10 dBm = 40 m to 70 m<br>0 dBm = 10 m to 30 m                                                                                                                                                                                                                                                                                                                                                                                            |
| Receiver sensitivity                                                   |                                                                                     | -80 dBm at 0 dBi antenna gain                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Antenna                                                                |                                                                                     | External antenna, not included in the scope of supply,<br>(see list of accessories)                                                                                                                                                                                                                                                                                                                                                                                |
| Antenna connection                                                     | (function element 18)                                                               | MCX                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Bluetooth profile                                                      |                                                                                     | <ul style="list-style-type: none"> <li>- GAP (Generic Access Profile)<br/>(method for authentication and connection establishment)</li> <li>- SDAP (Service Discovery Application)<br/>(method for requesting supported services)</li> <li>- SPP (Serial Port Profile)<br/>(COM port emulation method)</li> <li>- DUN (Dial-up Networking Profile)<br/>(modem dial-up method)</li> <li>- LAP (LAN Access Point Profile)<br/>(network connection method)</li> </ul> |
| Number of Bluetooth masters/Bluetooth slaves                           |                                                                                     | 1x master/7x slaves                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| LED indicator/Bluetooth data indicator                                 | (function element 3)                                                                | BT SIGNAL (1x yellow LED flashing),<br>Bluetooth is transmitting/receiving data                                                                                                                                                                                                                                                                                                                                                                                    |
| LED indicator/Bluetooth transmission quality                           | (function elements 3 - 5)<br>(function elements 3 - 4)<br>(function element 3)      | BT SIGNAL (1x yellow LED, 2x green LEDs), very good reception<br>BT SIGNAL (1x yellow LED, 1x green LED), good reception<br>BT SIGNAL (1x yellow LED), poor reception, close to the system reserve                                                                                                                                                                                                                                                                 |

**General Data**

|                                                         |                                                                                                                                                                          |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CE conformance                                          | According to R&TTE Directive 1999/5/EC                                                                                                                                   |
| Approvals                                               | UL (in preparation)                                                                                                                                                      |
| Ambient operating temperature range during operation    | -20°C to +60°C.                                                                                                                                                          |
| Housing<br>- Material<br>- Dimensions (H x W x D in mm) | ME 22,5 LWL LINE with 5-pos. ME-T bus contact and ground contact<br>ABS-VO, green<br>99 x 22.5 x 114.5 mm                                                                |
| Weight of device                                        | 120 g, approximately                                                                                                                                                     |
| Functional earth ground                                 | Housing contact with DIN rail                                                                                                                                            |
| Vibration resistance                                    | According to DIN EN 60068-2-6<br>5g, 2.5 h in each x, y, and z direction<br>Criterion A (no functional disruption)                                                       |
| Shock test                                              | According to DIN EN 60068-2-27<br>15 g, 11 ms pulse length<br>Criterion C (module is not damaged)                                                                        |
| Free fall                                               | According to DIN EN 60950 from a height of 1 m. without packaging                                                                                                        |
| Degree of protection                                    | IP20                                                                                                                                                                     |
| Air and creepage distances                              | According to VDE 0110-1, DIN EN 50178, DIN EN 60950                                                                                                                      |
| Ambient compatibility                                   | Free from substances, which would hinder coating with paint or varnish according to central standard P-VW 3.10.7 -3.10 0.757 650 of VW, Audi, and Seat (chloroform test) |
| Separate ground levels                                  | 24 V supply // 5 V logic + serial ports // functional earth ground                                                                                                       |
| Test voltage                                            | 1.5 kV AC, 50 Hz, 1 min. between all ground levels according to EN 50 178 and EN 61 131-2                                                                                |

**According to R&TTE Directive 1999/5/EC:****EMC<sup>1)</sup>**

Noise immunity (Electromagnetic Compatibility)

EN 61000-6-2:2001

Generic standard for the industrial sector

**Safety**

Protection of personnel with regard to electrical safety.

EN 60950 : 2001

**Health**

Limitation of exposure of the population to electromagnetic fields.

EC Gazette 1999/519/EC

EC Council recommendation of July 12, 1999

**Radio**

Effective use of the frequency spectrum and prevention of radio interference.

ETSI EN 300 328: V1.2.1, V1.4.1

**<sup>1)</sup> Addition: EMC (Electromagnetic Compatibility)**

Noise Immunity According to EN 61000-6-2

- Electrostatic discharge (ESD)

EN 61000-4-2

8 kV air discharge <sup>2)</sup>  
6 kV contact discharge <sup>2)</sup>

- Electromagnetic HF field  
Amplitude modulation  
Pulse modulation

EN 61000-4-3

10 V/m <sup>1)</sup>  
10 V/m <sup>1)</sup>

- Fast transients (burst)

Signal:  
Supply:

EN 61000-4-4

2 kV/2 min. <sup>2)</sup>  
2 kV/2 min. <sup>2)</sup>

- Surge current loads (surge)

Signal:  
Supply:

EN 61000-4-5

1 kV/42 Ω <sup>2)</sup>  
0.5 kV/2 Ω symmetrical <sup>2)</sup>  
0.5 kV/12 Ω asymmetrical <sup>2)</sup>

- Immunity to conducted interference

EN 61000-4-6

10 V/m <sup>1)</sup>

- Noise emission:  
Conducted emission  
Radiated emission

EN 55011

Class A

ETSI EN 300 328

EN 61000 corresponds to IEC 1000  
EN 55011 corresponds to CISPR11

<sup>1)</sup> Criterion A: Normal operating characteristics within the specified limits.

<sup>2)</sup> Criterion B: Temporary adverse effects on the operating characteristics that the device corrects automatically.

Class A: Industrial application, without special installation measures.

## 4. Function Elements/Diagnostics

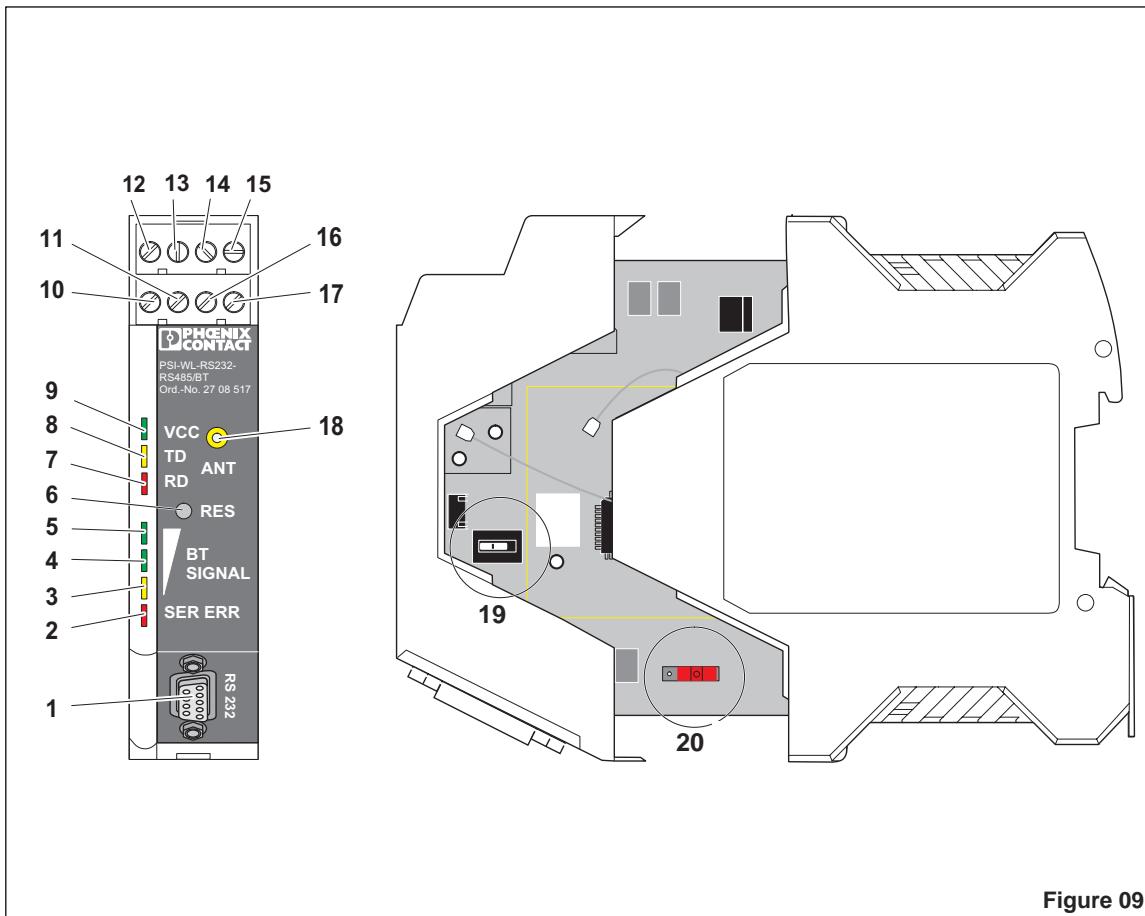


Figure 09

1. **9-pos. D-SUB**, V.24 (RS-232) data interface
2. **Red LED**, incorrect interface setting or buffer overrun
3. **Yellow LED**, poor reception, close to the system reserve
4. **Green LED**, good reception
5. **Green LED**, very good reception
6. **Pushbutton**, to reset settings
7. **Green LED**, dynamic, serial port is receiving data
8. **Yellow LED**, dynamic, serial port is transmitting data
9. **Green LED**, steady light during operation in RUN mode, flashing during operation in CONF mode
10. **↓**, shield connection

11. **GND**, operating ground
12. **VCC**, supply of 10 to 30 V DC, 24 V AC ±20%
13. **0 V**, supply of 0 V
14. **TA**, RS-422: Transmit negative
15. **TB**, RS-422: Transmit positive
16. **DA**, RS-422: Receive negative  
RS-485 2-wire: Transmit/Receive negative
17. **DB**, RS-422: Receive positive  
RS-485 2-wire: Transmit/Receive positive
18. **MCX connection**, for external antenna
19. **Switch for RS-422/RS-485 Terminate ON/OFF**
20. **Switch for CONF/RUN**